

FACTORS AFFECTING THE LOCATION OF ECONOMIC ACTIVITIES: A MULTI-DISCIPLINARY REVIEW AND CONCEPTUAL FRAMEWORK

W.G. Bam^{1,2}, K. De Bruyne^{2,1} & C.S.L. Schutte¹

ARTICLE INFO

Article details

Submitted by authors 16 Oct 2020
Accepted for publication 30 Sep 2020
Available online 14 Dec 2020

Contact details

* Corresponding author
wouterb@sun.ac.za

Author affiliations

- 1 Department of Industrial Engineering, Stellenbosch University, South Africa
- 2 Faculty of Economics and Business, KU Leuven, Belgium

ORCID® identifiers

W.G. Bam
<https://orcid.org/0000-0002-7465-9751>

K. De Bruyne
<https://orcid.org/0000-0002-4281-4542>

C.S.L. Schutte
<https://orcid.org/0000-0002-0119-720X>

DOI

<http://dx.doi.org/10.7166/31-4-2445>

ABSTRACT

A holistic framework that enables a systematic evaluation of the factors affecting the location of economic activities has thus far been lacking. Using a structured review, this research summarises the key developments that address this issue. Based on this review, a conceptual framework is proposed. The framework is location-centric – i.e., it evaluates the performance of a location in supporting a specific activity aimed at a particular market. It aims to assist both firms and policymakers to evaluate the key location determinants that drive the location of activities.

OPSOMMING

'n Holistiese raamwerk wat 'n stelselmatige evaluering van die faktore wat die ligging van ekonomiese aktiwiteite beïnvloed moontlik maak, het tot dusver ontbreek. Deur middel van 'n gestruktureerde literatuurstudie gee hierdie navorsing 'n samevatting van die belangrikste ontwikkelings wat hierdie kwessie aanspreek. Op grond van hierdie oorsig word 'n konseptuele raamwerk voorgestel. Die raamwerk is lokasie-sentries – dit wil sê, die prestasie van 'n plek word evalueer in terme van ondersteuning wat dit bied vir 'n spesifieke aktiwiteit wat op 'n bepaalde mark gerig is. Dit is daarop gemik om beide ondernemings en beleidmakers te ondersteun met die evaluering van die sleutelbepalings wat die ligging van aktiwiteite beïnvloed

1 INTRODUCTION

The factors that influence where firms initiate and locate their activities are of interest to a variety of stakeholders. Consequently, these factors are studied in a number of academic fields. These include studies that aim to evaluate patterns of economic activity with the aim, inter alia, of improving urban and regional planning [1]; studies that aim to understand how firms can best locate their activities to gain a competitive advantage [2]; and studies that enable governments to identify location-based factors that may be constraining economic growth [3]. Despite the rich range of the literature addressing location determinants, it appears that only a limited number of studies even attempt to provide a more holistic conceptualisation of them¹ [4]. Consequently, a proliferation of theories and approaches focus on different levels of analysis, resulting in much conceptual confusion about what these factors are and how they interact [5]. Such studies are also performed in a diversity of fields, and thus may be isolated from one another to various extents owing to their different academic traditions (e.g., [2, 6, 7]).

Bam and De Bruyne [8] argue that there is a need for tools that (i) identify the key location decision determinants at play for a particular activity; and (ii) given the location decision determinants, determine the fit of that activity within a particular region, given the region's specific properties. The need for such frameworks has grown owing to the increasingly global nature of supply chains and the associated increasing importance of location determinants [9]. The growing importance of wider considerations, such as social

¹ Notable exceptions include works such as Chen, Olhager and Tang [10] and Dunning [30].

and environmental impacts, has also increased the number of considerations that such frameworks must address [10].

It seems clear that there is a need to integrate better the developments in each of the disparate fields addressing location determinants, to propose a state-of-the-art holistic conceptualisation and systematic evaluation process of the location determinants influencing economic activities. This could not only support firms and policy practitioners in decision-making, but also provide a frame of reference for future research. Firms themselves are naturally a first important stakeholder of such a framework, as it could provide them with insight into the location-related factors that may influence their performance. Such a framework could thus be valuable in their location-related decision-making processes. Second, if governments want to attract a particular type of firm, they also require a full understanding of all location determinants that may affect firms' location decisions. This is particularly relevant within the framework of development policy – and beneficiation policy in particular [11]. For researchers, such a framework could guide future research by highlighting the gaps in knowledge and providing a harmonised frame of reference to improve interdisciplinary harmonisation.

We thus review the rich literature on the location of economic activities to *identify the key location determinants that affect the location decisions of economic activities*. In particular, we seek to identify patterns, overlaps, and complementarities in the factors considered. Our goal is to consolidate these in a conceptual framework. We embed this framework in a phased assessment process that enables the systematic consideration of the key location determinants identified in the different research fields.

The remainder of this paper is structured as follows. Section 2 provides an initial overview of the main fields addressing location determinants. The methodology that was followed to review these fields in a structured way is discussed in Section 3. Section 4 tackles the results obtained from the review. Section 5 presents a novel conceptual framework of the key factors that affect the location of economic activities, along with a supporting four-phase analytical process. Finally, Section 6 summarises the paper and concludes with a discussion of the implications of the research. Appendix A provides more detail on the review results, while Appendix B contains the detailed elements of the framework (the summary of which is contained in Section 5). The supplementary material to this article (S1) provides further background information on the review methodology and the methodologies employed in the reviewed articles.

2 LITERATURE FIELDS CONSIDERED

Before the structured review was performed, an extensive exploratory literature review was undertaken to identify the main fields that have contributed to the rich variety of the literature addressing location determinants. This section provides an overview of the six fields identified during the exploratory review.

The field of **general economics** has systematically addressed different location determinants over time. Some of the early dominant frameworks related to the location of economic activities included the law of comparative advantage proposed by Ricardo [12] and the related factor-proportions theory [13]. A more recent wave of interest in mainstream economics in the factors affecting the location of economic activities was driven by works such as Krugman [14] and Venables [15], which established the so-called 'new economic geography' (NEG) strand of research in economics [16], [17]. The NEG models provide an endogenous perspective, and show that an initial location determinant can attract a firm but, by doing so, can also reinforce the strength of the location determinant itself and thus attract more firms in the future – until this effect is counteracted by emerging congestion effects. This is referred to as the 'snowball effect' [18].

The **economic geography literature** studies the location and spatial organisation of economic activities across the world, and represents a traditional subfield of the discipline of geography. However, as geography has been increasing in importance in general economics, many economists have also contributed to the field in ways more typical of the discipline of economics. Some of the first roots of the field of economic geography can be traced to classical location theory [19], [20], studies focused on the market area and emerging location patterns if decision-makers seek to make optimal location decisions [21], [22], and central place theory (CPT) [23], [24]. More recent developments in this field include the renewed interest in industrial clusters [25]. These build on the work of early industrial geographers such as Marshall [26] and on the related impact of knowledge generation and transfer on the geography of economic activities [27].

The **general management literature**, seeking to support management and policy decisions, has seen a number of attempts to consolidate an understanding of location determinants and how they impact

profitability. Arguably, one of the best known frameworks that addresses location in a wider context is the eclectic paradigm put forward by John H. Dunning, focusing on the ownership, locational, and internalisation advantages and how they impact the foreign direct investment behaviour of firms [28]–[30]. Another attempt that assumes a framework of location determinants and that has had considerable influence is the diamond of competitiveness proposed by Porter [31], which supported a period of renewed interest in activity clusters, including in the economic geography literature [32], [33]. Another influential model in the management literature has been that proposed by Ferdows [34], which focused on the different roles that plants may fulfil in a manufacturing company's strategy and how these roles influence location choice [35].

The **operations and production management literature** has also seen some examples aimed at providing a more holistic consideration of factors influencing the location of economic activities. The subject is often framed in the context of companies seeking to optimise their competitive positions by locating different activities in particular places. Illustrative studies include the Delphi study undertaken by MacCarthy and Atthirawong [36] and the thesis by Pongpanich [37], both of which focus on the factors that influence the international location decisions for manufacturing operations. More recent operations and production management literature has addressed location determinants in the context of the *off-shoring* and *reshoring* debate [38], [39]. Chen, Olhager and Tang [10] provide a literature overview of the different location determinants in the operations and production management literature, in which they allow for the increasing importance of sustainability in location decisions – something that has been largely missing in, for example, the general economics literature.

Another field of analysis implicitly addressing an important range of determinants that influence the location of economic activities can be found in the literature focusing on **innovation**. This includes works focusing on national systems of innovation [40], [41], regional innovation systems [42], sectoral innovation systems [43], [44], technology innovations systems [45]–[47] and the literature on socio-technical systems [48], [49].

In the **development literature**, a rising number of articles tangentially or implicitly address the location choices of economic actors. This includes articles building on the global value chain (GVC) framework proposed by Gereffi, Humphrey & Sturgeon [50] and the global production network (GPN) framework proposed by Henderson *et al.* [51]. Most of these discussions have focused on power relations between different economic actors in value chains and the developmental and value capture implications of these relations [52], [53].

3 RESEARCH METHODOLOGY

After identifying the six research fields that address location determinants through the exploratory literature review, a structured review of each of the identified main academic fields was undertaken. This review sought to identify the most influential research that i) addresses the factors that influence the location of economic activities, and ii) consolidates these factors into more holistic conceptual frameworks.

Two approaches were followed to identify relevant articles in each of the identified fields. First, a journal-based approach was followed to identify relevant publications in the leading journals in each of the identified fields. Second, the Scopus® research field functionality was used to identify any highly cited papers that were not included from the journal-based identification approach. The final sample of articles was then studied, and the findings consolidated and compared for the different fields.

For the journal-based approach, the search was limited to the top five (in impact) relevant journals in each of the six fields. The impact of the journals was evaluated by studying their 2017 SCImago® Journal & Country Rank (SJR) values as reported on the public SCImago® website, based on the citation data from Scopus® [54]. This metric was chosen – despite some of its known drawbacks [55] – as it does not rank journals merely by the number of citations per article, but by the quality of those citations based on a PageRank algorithm [56], [57]. For each field of research, a relevant subject area and subject category(ies) were identified on the SCImago® website (these are indicated in Table 1). Within these categories, journals were ranked according to their SJR ranking, and the top five relevant journals were identified. The relevance of the journals was determined by studying their aim descriptions on their home pages. Two of the authors independently reviewed the top-rated journals and selected the top five journals (in terms of SJR score) that were relevant to this study for each field. The two lists were then compared, and any discrepancies were settled through consensus and discussion with the third author. A summary of the resultant journal choices is presented in Table 1.

Table 1: Summary of selected journals

<i>Research field</i>	<i>General economics</i>	<i>Economic geography</i>	<i>General management</i>	<i>Operations and production management</i>	<i>Innovation studies</i>	<i>Development studies</i>
Subject area (SJR)	Economics, econometrics, and finance	Social sciences	Business, management and accounting	Engineering; economics, econometrics and finance; business management and accounting	Business, management, and accounting	Social sciences
Subject category (SJR)	Economics and econometrics	Geography, planning and development	Strategy and management; business and international management	Industrial and manufacturing engineering; economics, econometrics and finance (miscellaneous); business management and accounting (miscellaneous)	Management of technology and innovation	Development
Journals selected	Quarterly Journal of Economics	Journal of Economic Geography	Academy of Management Annals	Journal of Operations Management	Research Policy	Journal of Development Economics
	Econometrica	Economic Geography	Academy of Management Journal	Journal of Supply Chain Management	Journal of Product Innovation Management	World Bank Research Observer
	Journal of Political Economy	Cambridge Journal of Regions, Economy and Society	Strategic Management Journal	Production and Operations Management	Technovation	Population and Development Review
	American Economic Review	Environment and Planning D: Society and Space	Academy of Management Review	International Journal of Production Economics	Innovation Policy and the Economy	World Development
	Review of Economic Studies	Environment and Planning A	Journal of Management	Journal of Business Logistics	Technological Forecasting and Social Change	International Journal of Urban and Regional Research

The most influential articles in these journals that related to the location decisions of economic activities were sought. The articles were required to provide either i) a discussion of a factor(s)/empirical study of the factors that affect the location of economic activities; or ii) frameworks that theoretically/conceptually combine the factors that may affect the location of economic activities. To ensure that only articles relating to the location of economic activities were included, an abstract, title and keyword search was performed for each field, limited to the selected journals, for all articles that include the term *locat** – the asterisk denotes that all alternative endings to the term (such as *location*, *locating*, and *locate*) were also included in the search. To ensure that the articles further related to one of the two location themes described above, matching documents were required that also included: i) the terms *Framework** or *Model**; or ii) *Factor** or *Element** or *Driver** or *Variable** or *Determinant**. The resulting number of documents for each field that met these search term requirements is indicated in Table 2.

The 50 most cited articles in the sample for each field were reviewed in order to determine their relevance to one of the two aims of the review. The first filtering was done on the title to exclude any articles that clearly did not match the review aims. This was followed by a further filtering that included reviewing at least each article's abstracts and, in most cases, the rest of the paper to determine whether it contributed to the stated aims of the review. The number of articles identified as relevant after this manual filtering of the top 50 most cited articles in each field, and thus included in the full review, is indicated in Table 2.

Table 2: Number of documents matching search criteria in the chosen journals

	<i>General economics</i>	<i>Economic geography</i>	<i>General management</i>
# of documents included in full review	9	15	17
# of document meeting search term requirements	101	396	71
Total # of documents in journals listed on Scopus® on search date ²	15 155	6 447	7 390
	<i>Operations and production management³</i>	<i>Innovation studies</i>	<i>Development studies</i>
# of documents included in full review	12	26	8
# of document meeting search requirements	344	176	153
Total # of documents in journals listed on Scopus® on search date	9 728	11 095	12 259

To ensure that no crucial articles were omitted owing to the choice of journals, the Scopus® subject area functionality was used to identify any highly cited papers not included in the journal-based approach that met our search criteria. The top 200 documents (in terms of citations) meeting the search criteria in any of the following Scopus® subject areas were reviewed and added to each of the six research fields as appropriate: i) Social sciences; ii) Business, management, and accounting; and iii) Economics, econometrics, and finance⁴. These papers were then filtered in a similar way to the filtering of the papers identified through the journal search. The contribution of the additional search to the journal-based sample is shown in Table 3. Table S1.A in ‘Supplementary material S1’ summarises the date and citation range of the final sample for each research domain.

Table 3: Contribution of additional search to final literature sample

	<i># of new documents added to final sample</i>	<i># of documents already in journal-based review</i>
<i>General economics</i>	5	6
<i>Economic geography</i>	4	2
<i>General management</i>	1	5
<i>Operations and production management</i>	1	0
<i>Innovation studies</i>	0	2
<i>Development studies</i>	1	0

4 REVIEW RESULTS

The results from the detailed review of the final document sample in each academic field are discussed in this section according to i) the general themes covered; ii) the unit of analysis employed; iii) the key market related factors considered; iv) the location related factors considered; and v) the interactions and dynamics considered.

4.1 General themes

The general themes addressed in each field are identified in Table 4 along with their references. Apart from these themes, some observations can be made about peculiarities in the samples. In the **general economics** field, the studies generally focused on a limited number of determinants or used higher-level determinants that would be composed of a variety of sub-determinants in studies in other fields. In the **economic geography** sample, many articles appeared to focus on concepts related to the cluster theory. The **general management literature** can be distinguished from the general economics and economic geography literature, based on its particular focus on firms and their strategies. Many articles in the management literature sample also explicitly align with or critique particular theoretical schools of

² Searches were performed between 31 July 2018 and 5 September 2018.

³ One article in the *Innovation Management Journal* sample [107] was found to relate to location decisions in the context of supply chains. It was therefore reclassified in the operations and production management sample.

⁴ Search performed on 24 September 2018.

thought. Some of those mentioned most often in the sample included internalisation/transaction cost theory, the OLI framework/eclectic paradigm, the resource-based view/theory, capability theory, neo-institutional theory, oligopolistic interaction, agglomeration theory, international product life cycle theory, and the stage theory of internationalisation. The **operations and production management literature** sample generally focused on providing firms with guidance to improve their decision-making. One article in the sample explicitly referred to sustainability considerations as captured in the concept of the triple bottom line, and how all three of these considerations (economic, social, and environmental) might influence locational decisions. This provides a perspective that is not thoroughly considered in any of the other literature samples. A number of articles in the **innovation management literature** sample were similar to the management literature in the sense that there was a focus on firms and multinational firms in particular. However, the focus was specifically on the R&D functions of the firms. The articles in the **development studies** sample tended to draw predominantly from either the general economics or the economic geography methodologies. **Supplementary material S1** provides an overview of the methodologies used in each paper, and a summary of these methodologies is given in Table S1.B.

Table 4: General themes per field

	Theme	Reference
General econ.	Economic agglomeration determinants	[7], [14], [15], [58]-[60]
	Factor productivity determinants	[61], [62]
	Foreign direct investment (FDI) determinants	[63]-[65]
	International trade determinants	[66], [67]
	Development determinants	[68]
Economic geography	Conceptualisation and dynamics of clusters	[25], [69]-[76]
	Conceptualisation of localisation	[77]
	Dynamics of knowledge generation and protection	[78]
	Dynamics of knowledge spillovers	[79]
	Innovation determinants	[80]
	Firm headquarter location decisions	[81]
	Location behaviour of entrepreneurial firms	[82]
	Empirical location patterns in industry	[83]
	Critique of existing research and research agenda	[27]
	Determinants of growth of cities in developing countries	[84]
	Similarities between 'new economic geography' models	[85]
General management	Behaviour, choices, and strategy of multinational firms	[30], [86]-[95]
	Conceptualisation and dynamics of clusters	[96], [97]
	Agglomeration decisions	[2], [98]
	Conceptualisation of firm knowledge	[99]
	Optimising facility location	[100]
Ops. & prod. man.	Innovation strategies of firms	[101]
	Performance implications of firms' locational decisions	[102]-[105]
	Evaluating how more optimal decisions regarding facility location may be approached	[10], [106]-[109]
Innovation management	Methods for activity allocation to facilities in different locations	[6], [110]-[112]
	R&D and innovation activities of enterprises	[113]-[123]
	Determinants of the emergence and performance of new-technology-based firms (NTBFs)	[124]-[126]
	International trends related to global R&D	[127]-[129]
Development studies	Innovation related dynamics in clusters/regions	[130]-[138]
	Determinants of FDI location	[139]-[142].
	Determinants of R&D location	[143]
	Location-related determinants that affect economic development	[3], [144]
	Patterns of activity linkages in the automotive industry, and how they affect the developmental outcomes in the location where these activities take place	[145], [146]

4.2 Unit of analysis

The units of analysis varied throughout the studies. The general economics sample often focused on the country or state level. The economic geography literature more often focused on the regional level, while the general management, operations, and production management, innovation management, and even development studies literature samples all included a number of studies using the firm as the key unit of analysis. These different units of analysis implied different abilities to generalise, and also the attainment of different insights. The general management and innovation management samples also highlighted the

value of using a unit of analysis even more granular than a firm. In particular, the general management literature elaborated on the distinction between the functions and roles of different subsidiary facilities in different locations over time. Specifically, certain articles explicitly distinguished between the location of the manufacturing [30], [94], [95], research and development [90], [91], [94], [95] and marketing [30], [94] functions. In the context of the multinational enterprise (MNE), different types of subsidiaries were identified with various roles and capabilities [30], [90], [94] and thus with power in the enterprise [94]. However, Rugman and Verbeke [95] warn of relying overly on classifying the roles of subsidiaries, as one subsidiary may have various concurrent roles that are dynamic over time. The innovation management sample underscored the importance of untangling the different activities that make up R&D and the decomposability of the underlying activities. R&D might, for example, be decomposed into i) research and ii) development, respectively [115] or i) basic research, ii) applied research, and iii) development [129].

4.3 Market-related considerations

The most often recurring theme identified in the **general economics** literature was related to the location [14], [59], [60], [147] and size of demand/regional markets [4], [64] or so called ‘downstream (output) linkages’ [7], [67], [148]. This was also echoed in the **economic geography** [69], [81], [85], **general management** [30], [89], [90], [92], [100], [101], **operations and production management** [6], [10], [107]-[111], **innovation management** [115], [116], [121], [122], [129] and **development studies** [140], [141] literature samples.

However, this was taken further in the **management literature**, where the nature of demand conditions, such as the regional specificity and sophistication of consumer tastes, were specifically considered [93], [94], [101]. One work in the **operations and production management** literature further described demand in terms of the demand zones within a country [109]. Two articles acknowledged the specific requirements of markets or market segments such as price, service policy, and availability [103], [109]. Attention was also paid to demand variability and its impact on risk and optimal location decisions [106], [107], [111]. Similar to the other literature samples, the competition in the market was explicitly acknowledged [10], [105], [107], [108], [110]. The **innovation management** sample also highlighted that R&D is not attracted to large markets per se, but rather by large markets that have a high degree of specificity (i.e., it is important to understand consumer tastes in that market in order to compete in the market, as requirements might differ from other markets in which firms operate) [115], [116], [121], [122], [129]. R&D is also particularly attracted by markets with leading consumer tastes, as this provides firms that are monitoring these markets with a first mover advantage if they are the first to anticipate a new trend or consumer demand [114], [120]. This was also linked to locating in markets where leading regulation- and standard-setting often takes place to ensure that firms stay abreast of new developments [114], [120].

4.4 Location-related considerations

Various determinants related to the ability of firms to operate successfully at a particular location (not considering the location and properties of the market) were mentioned in the literature. This included the presence of so called ‘upstream (input) linkages’ or the related availability and cost of intermediate inputs, proximity to suppliers, availability of knowledgeable suppliers, cost of supplier management, and quality of inputs. It also included labour costs, available human capital, or the availability of the necessary skills (including managerial skills and semi-skilled labour). Apart from skills, labour, and material inputs, other factors such as the cost of utilities and specialised support services were also mentioned, as were natural advantage (including geography, climate), and the cost of capital (which includes physical capital, financial capital, and the cost of land). Infrastructure availability, quality and reliability, and transport costs also influenced location decisions, as did government-influenced factors such as taxes, exchange rates, investment incentives, promotional activities, training grants, environmental regulations, special economic zones, and trade protection. Some articles specifically studied the factors that lead to the establishment of SMEs and high-tech SMEs. These included the knowledge capacity and foundational technology of a region, including the human capital and knowledge output of nearby universities, and venture capital. Each of these factors was linked to their source documents in Table A.1 in Appendix A. Each of the literature fields also identified the different properties of industries and/or firms that would moderate the importance of the various location determinants. These are presented in Table A.2 in Appendix A.

4.5 Interaction and dynamics

Apart from the particular market- and location-related factors that affected the location of economic activities, the various fields of literature samples also considered how various dynamics influence locational outcomes. The different field samples generally focused on different dynamics, which are discussed below. The detailed references for each of the dynamics are contained in Table A.3 in Appendix A.

In the **general economics** sample, several papers focused on the interaction between demand and supply and how ‘snowballing’ effects can lead to activity agglomeration. The outcome is moderated by transport costs, which affect the interaction between demand and supply. This snowballing effect leads to the emergence of path dependence and ‘historical accidents’ in the agglomeration of economic activities.

The **economic geography** literature aimed to untangle and evaluate the importance of the different dynamics that might be driving the agglomeration effects. These papers especially focused on determinants that drive innovation – including, e.g., social and economic environment and norms, education, networks, access to knowledge, and IP protection. Expectations of these dynamic processes might even become self-fulfilling. Furthermore, agglomeration economies may lead to hysteresis – i.e., large changes in comparative advantage are needed to induce changes in location agglomerations. However, when changes are large enough to induce change, this change can be dramatic.

The **general management** sample considered dynamics such as differentiation spillovers for service firms, the effect of technological progress, the contingencies that affect the impact of local experience effects, learning curve effects, the bandwagon effect (whereby companies make decisions based on limited information and mimic the behaviour of other firms), behaviours dependent on the behaviour of competitors, the development of capabilities of firms over time, the evolution of subsidiary-specific roles and capabilities over time, as well as the importance of uncertainty related to location decisions.

The **operations and production management** literature focused on both expectations and the effect of uncertainty and risk on operations planning and profitability. The risks mentioned in the operations and production management literature sample included financial risks (e.g., exchange rate volatility), chaos risk (e.g., the bullwhip effect), regulation risk, political risk, input supply risk (in terms of quality and quantity available at a particular point in time), demand risk (e.g., planning based on under- or over-estimations), intellectual property protection risk, process quality risk, and reputational damage risk. The operations and production management literature sample also addressed other dynamics. In particular, the importance of expectations was highlighted again, as was the dynamic nature of locational differences over time. Finally, supply-demand interaction may impact the magnitude of holding costs, obsolescence, and stock-outs. Complementing cost implications, metrics such as lead time performance, responsiveness to customer demand, quality performance, customer service level, time to market and flexibility, environmental performance, and social performance were highlighted as important for sustained competitiveness.

Some articles in the **innovation management** sample aligned with the focus of articles in the economic geography literature sample by highlighting the positive impact of industry agglomeration on the innovative performance of firms. Others studied the dynamics of apparent knowledge spillovers. These studies highlighted the importance of social and human capital and of investment in research and development for innovation, and the institutional dynamics that support the commercialisation of research in a country. In the **development studies** sample, the expectations about corruption, bureaucratic delay, and nationalisation risk were found to impact activity location.

5 CONSOLIDATED LOCATION CENTRIC ANALYSIS FRAMEWORK

Following the methodology outlined by Jabareen [149], this section consolidates the key location factors identified in the review into a conceptual framework. In particular, to construct the framework, we integrated concepts that had similarities into new encompassing concepts. These were then synthesised into a theoretical framework that was divided into different stages of analysis that follow one another. The framework was iteratively refined to ensure that it was internally consistent and interpretable by stakeholders.

The aim of this framework is to support the systematic evaluation of the factors affecting the location decisions of economic activities. The proposed framework is **location centric** – i.e., it evaluates the performance of a location in terms of supporting a particular activity aimed at a particular market. It enables the comparison of various locations for supporting the same activity. It is therefore useful for guiding company location decisions, as well as providing policymakers with a greater understanding of the key factors that affect a particular location’s ability to attract and support particular economic activities. First, an overall location-centric conceptualisation of the interplay between demand (market) and supply (location) is provided. This is then expanded upon with four phases of analysis that logically follow one another to enable a systematic analysis of the determinants that influence the location decision of a particular economic activity. Within each phase, the key aspects for analysis are outlined in order to guide

a detailed location analysis. In phase 0, before any actual investigation can be performed, the unit of analysis needs to be clearly defined. Phase 1 focuses on the market, and phase 2 on the location, while phase 3 tackles the interaction and dynamics at play. In phase 1, three sub-sections can be spelled out: (i) the definition of the market, (ii) the consumer requirements within that market, and (iii) the identification of market determinants. Phase 2 defines (i) the static performance determinants and (ii) the factors that moderate the importance of location determinants for the different units of analysis. Phase 3 focuses on the dynamics that influence the market and location determinants over time. This naturally includes the interaction between demand and location.

5.1 Market and location

The location of activities is fundamentally driven by the ability to perform certain activities at a given location in order to meet the demand of customers at the same and/or other locations. For footloose multinationals, different locations for a particular activity must be compared against the performance level that can be attained at different locations, and the ability to interact with and supply the targeted markets from that location. Similarly, entrepreneurs have to consider whether a particular activity would be viable in the location being considered, given the same considerations. This tension between attainable performance and market requirements is illustrated in Figure 1. On the one hand, different markets and market segments will be geographically separated. These markets will also have different requirements. In particular, it can be expected that the customers in each market segment will have a particular utility function and linked demand curve that determines which and what quantity of competing outputs from the focal activity they will consume. This utility function will be a function of a variety of performance dimensions (in the case of manufacturing, for example, this might include cost, quality, responsiveness and lead time). On the other hand, the multinational firm must weigh the performance levels that can be attained at different locations. The choice of location will also imply different effective performance levels for different markets, as the locational performance is moderated by the interaction cost with the various markets from the chosen location. Finally, a location decision, and the factors affecting it, are not static. Indeed, the expected changes in market sizes, the utility functions of these markets, the competing firms and outputs at various locations, and the changing levels of attainable performance at different locations should all be considered when evaluating the location of economic activities, as these changes and expectations surrounding these changes affect location decisions. This is also illustrated in Figure 1 (by two cross-sectional snapshots of the market-location interaction at time t and time $t+s$). The rest of this section provides a sequential analytical process for evaluating each of the components relevant to the interaction highlighted in Figure 1. The letters B_1 to B_5 refer to the different building blocks that ultimately form our consolidated framework. These building blocks are derived in (sub)sections 5.3.3, 5.4.1, and 5.5, and can be found in Appendix B.

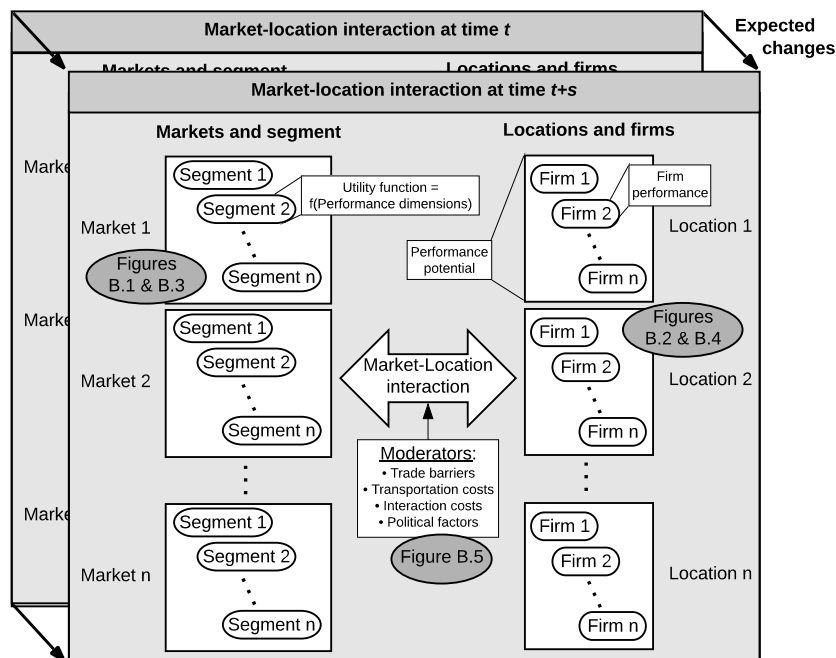


Figure 1: Dynamic interaction between market and location

5.2 Phase 0: Setting the unit of analysis

As identified in the review section, the analysis of location determinants can take place at country, state, or regional level. The actual first step towards locational decisions and the analysis of the locational determinants of an activity is, however, the clear identification of the activity(ies) under evaluation [109], [114]. This is the unit of analysis that is crucial for our framework. While some studies evaluate the location of economic activities in general, a number of studies in the review sample acknowledged the vast heterogeneity between industries (and activities within an industry) in the factors that affect their location. It is therefore important to determine (i) the industry the activity belongs to, and (ii) the type of/specific firms that undertake the activity. The more detailed the definition of the industry and the firms, the more insightful and effective will be the analysis of the determinants of the location of the activity. This is considered further in Phase 2, where the factors related to the type of industry and firm that alter the importance of the location determinants are considered.

To complicate matters further, studies in the review highlighted that there is often an interdependency among a company's different activities. Therefore the location of the different activities of a firm (e.g., headquarters versus manufacturing versus research versus development – and the sub-components of these) and how it impacts the activities under consideration should ideally be considered too. Thus a firm-specific analysis would increase the accuracy of the analysis, especially when considering activities that are usually performed by multi-function multinational enterprises. Clearly, the type of firms and/or the specific firms and their range of activities should ideally be specified before beginning further analysis. Given the distinctions used in the review literature, our framework also specifically distinguishes between the requirements for manufacturing-, research- and development-related activities.

5.3 Phase 1: Market analysis

The first phase of analysis entails the consideration of the market and its segments in three steps. First, the market is defined. Second, the market requirements are identified. Third, the various market determinants are considered.

5.3.1 Market definition

Once the particular activity for which the location determinants are to be evaluated has been identified, the market for these activities needs to be specified. In particular, the demand location, market size, and market segments need to be specified. If the market is dominated by a few customers or even a single internal 'customer' (e.g., another department in a multinational company), the analysis might be somewhat simpler. Some of the most pertinent market-related considerations are outlined in Table B.1 in Appendix B for the three types of firms analysed. For manufacturing, the size of the local or regional market is particularly relevant. For development activities, the size of the market with similar tastes is important. For research activities, the sophistication of customers plays a larger role.

5.3.2 Market requirement definition

Once the market is defined, it is imperative to determine what consumers in the market require. In other words, for each market segment, the key requirements that need to be met should be identified. This is critical if the impact of the location on the 'success' of the activity is to be determined, as this is ultimately dictated by the customer segment linked to the activity (emergent from interaction between the customer's utility and demand function and the output from competing firms). The performance metrics of interest will vary by customer segment and activity. For example, for manufacturing-related activities, performance on metrics such as cost, quality, service level, flexibility, lead time, responsiveness, and environmental impact might be crucial, depending on the market segment being targeted. In the case of research, other metrics, such as the ability consistently to perform cutting-edge research and to protect intellectual property might be more important metrics. Similarly, for development activities, responding to local customer requirements, including achieving rapid time to market, might be important. Not only the current requirements per customer segment, but also how these might change over the course of the planning horizon, should be considered. The performance dimensions relevant to manufacturing, research, and development, as well as their interdependence, are elaborated on in Table B.2 in Appendix B.

5.3.3 Identifying static market determinants

For governments that wish to evaluate and influence the market that is accessible from a particular location, and for companies that seek to understand current and to predict future market sizes and requirements, market determinants become important. Thus the main market determinants identified during the review are summarised in the first static figure of our consolidated framework, Figure B.1 in Appendix B. It comes as no surprise that location factors such as per capita income, trade protection, and infrastructure play a crucial role here.

5.4 Phase 2: Location analysis

Turning to the location, phase 2 addresses the determinants that influence the performance that is attainable at a particular location, and the factors that moderate the importance of any particular determinant.

5.4.1 *Identifying static performance determinants*

On the location side, it is indispensable to determine the performance of the firms, given the focal activity defined in phase 0. In particular, which determinants are most important for driving the static performance of manufacturing, research, and development are outlined in the second static figure of our consolidated framework, Figure B.2 in Appendix B. It comes as no surprise that location determinants such as cost and lead time play an important role for manufacturing firms, while (for example) IP regulation and skills availability are more relevant for research- and development-intensive firms.

5.4.2 *Factors that moderate the importance of location determinants related to the type of industry and firm*

As stated in phase 0, however, the type of industry and firm might influence the impact of the location determinants. Table B.2 in Appendix B summarises the full set of moderating factors related to the type of both industry and firm that resulted from our review. For example, for an industry that has a very dynamic product environment, access to knowledgeable supporting firms will be an important location determinant; while for industries that have considerable returns to scale, cost factors will matter more. Similarly, at the firm level we find that, for instance, for technologically intensive firms, skills availability will matter more. For firms with a high imitability of their advantages, IP protection will be more important. Given these (limited) examples, it is obvious that the location determinants are industry- and firm-specific, such that phase 0 becomes crucial when evaluating location determinants.

5.5 Phase 3: Interaction and dynamic analysis

Once the key static market- and location-related factors have been identified, different locations can be compared for the performance that is expected to be attained, and hence the possible market share to be competed for at a particular location. This requires the evaluation of the 'effective performance' that each location can offer to each market, given the market-location interaction moderators such as trade barriers and interaction costs highlighted in Figure 1. The dynamics related to the market, the location, and the market-location interaction should also be considered. In our framework, the market-related dynamics identified in the review are outlined in Figure B.3 in Appendix B; those related to the location in Figure B.4 in Appendix B; and those related to the market-location interaction in Figure B.5 in Appendix B. For example, market size and taste may change over the planning horizon owing to factors such as migration and social development. Similarly, the cost of production at a particular location, for example, may change owing to exchange rate changes or congestion effects from the growth of the industry. In terms of the interaction moderators, new trade restrictions, for example, may influence the market size that is accessible from a particular location. Finally, given the expected dynamics and expected performance, market and market share evaluations can be undertaken for the planning period. Based on these evaluations, firms can consider which locations provide the performance that is sought, cognisant of the risks and uncertainties that have been identified. Similarly, policymakers and regional planners can consider which performance metrics are likely to underperform over the planning horizon, and which determinants are responsible for this underperformance. The feasibility of measures that might address either these determinants or other determinants to compensate for the underperforming ones can then be investigated. Along with the two static Figures B.1 and B.2, the three dynamic Figures B.3-B.5 complete our consolidated location-centric framework outlined in Figure 1. Together they provide an overview of static and dynamic location decision determinants – taking into account the unit of analysis.

6 CONCLUSION

This paper identifies the need to consolidate the myriads of location determinants that are discussed in various fields of research. In particular, such a consolidation could support the coherence of future research and provide companies and policymakers with a useful reference for practically evaluating the impact of various locational determinants of economic activities. Six academic fields were identified as having particular bearing on the location of economic activities. These are general economics, economic geography, general management, operations and production management, innovation studies, and development studies. The top five journals in these fields were identified, and a structured review of the most often cited papers in these journals that met specific search criteria was conducted. This was complemented by a further search for the most often cited papers that met the search criteria without considering the specific journals in which they were published. The final sample from these searches was

then reviewed to determine the key location determinants identified in these studies. These were consolidated in a novel conceptual framework that enables the systematic evaluation of the myriad factors that might affect the location of economic activities. In order to enable decision makers in companies, as well as policymakers, to operationalise the location-centric conceptual framework, it is embedded in a four-phase analytical process. However, it is clear that the importance of the different location determinants established through our approach will vary for different scenarios (sectors/firms). It is therefore obvious that, depending on the sector and/or firm a government wants to attract or develop, or the firm using the framework, there will be a need to focus more on a particular subset of location determinants. Our – by definition – generic tool thus provides a reference framework for industry- or firm-specific analytical frameworks.

Our research makes various contributions to research and practice. First, we contribute to the research literature by drawing from and integrating largely separate bodies of knowledge. Second, we contribute to the analytical tools used in production and operations management and to the general management literature with respect to guiding firm location decisions. Third, we contribute to the tools in the development and economic geography literature concerned with guiding improved policy decision-making in targeting key factors that may hinder the growth of an activity at a particular location, and evaluating factors that drive particular location outcomes. Finally, our synthesised framework may serve as a frame of reference for future research in each of the identified fields.

Our research serves as a first iteration of a generic framework. We hope that further research will extend and refine our contribution. Future research is also required to understand fully how the different moderating factors identified in this work influence the impact of the various location determinants on the location of particular economic activities. There is also a need to integrate further the consideration of firm emergence and growth into the framework. From a developmental perspective, policymakers may also be interested in understanding how economic activities impact regions in terms of economic, social and environmental outcomes. Adding this perspective to the current framework may also be useful. There is also a need to understand better how different policies might impact each of the identified location determinants. In particular, understanding the dependencies and feedback loops at play are important to guide optimal policymaking. In summary, despite the vast literature on the location of economic activities, considerable research is still required to untangle the various dynamics that influence the location of economic activities.

ACKNOWLEDGEMENTS

The financial support of VLIR-UOS (through the South Initiative 2020 ‘Improving Industrial Policy Intervention in South Africa’ project [SI-2020-01-88]) is gratefully acknowledged.

REFERENCES

- [1] Kanai, J.M. & Schindler, S. 2018. Peri-urban promises of connectivity: Linking project-led polycentrism to the infrastructure scramble. *Environ. Plan. A*, 51(2), pp. 302-332.
- [2] Alcácer, J. & Chung, W. 2014. Location strategies for agglomeration economies. *Strateg. Manag. J.*, 35(12), pp. 1749-1761.
- [3] Redding, S. & Schott, P.K. 2003. Distance, skill deepening and development: Will peripheral countries ever get rich? *J. Dev. Econ.*, 72(2), pp. 515-541.
- [4] Blonigen, B.A. 2005. A review of the empirical literature on FDI determinants. *Atl. Econ. J.*, 33(4), pp. 383-403.
- [5] Pellenbarg, P., Van Wissen, L. & Van Dijk, J. 2002. Firm migration. In P. McCann, ed., *Industrial location economics*. Cheltenham: Edward Elgar Publishing.
- [6] Bhutta, K.S., Huq, F., Frazier, G. & Mohamed, Z. 2003. An integrated location, production, distribution and investment model for a multinational corporation. *Int. J. Prod. Econ.*, 86(3), pp. 201-216.
- [7] Ellison, G. and Glaeser, E.L.L. 1997. Geographic concentration in U.S. manufacturing industries: A dartboard approach. *J. Polit. Econ.*, 105(5), p. 889-927.
- [8] Bam, W. and De Bruyne, K. 2017. Location policy and downstream mineral processing: A research agenda. *Extr. Ind. Soc.*, 4(3), pp. 443-447.
- [9] Baldwin, R. 2013. Trade and industrialization after globalization’s second unbundling: How building and joining a supply chain are different and why it matters. In R.C. Feenstra & A.M. Taylor, eds, *Globalization in an age of crisis: Multilateral economic cooperation in the twenty-first century*, pp. 165-212. Chicago: University of Chicago Press.
- [10] Chen, L., Olhager, J. & Tang, O. 2014. Manufacturing facility location and sustainability: A literature review and research agenda. *Int. J. Prod. Econ.*, 149, pp. 154-163.
- [11] Bam, W. & De Bruyne, K. 2019. Improving industrial policy intervention: The case of steel in South Africa. *J. Dev. Stud.*, 55(11), pp. 2460-2475.

- [12] Ricardo, D. 1817. *On the principles of political economy and taxation*. London: John Murray.
- [13] Ohlin, B. 1933. *International and interregional trade*. Cambridge, MA: Harvard University Press.
- [14] Krugman, P. 1991. Increasing returns and economic geography. *J. Polit. Econ.*, 99(3), pp. 483-499.
- [15] Venables, A.J. 1996. Equilibrium locations of vertically linked industries. *Int. Econ. Rev. (Philadelphia)*, 37(2), pp. 341-359.
- [16] Krugman, P. 2009. The increasing returns revolution in trade and geography. *Am. Econ. Rev.*, 99(3), pp. 561-571.
- [17] Krugman, P. 2011. The new economic geography, now middle-aged. *Reg. Stud.*, 45(1), pp. 1-7.
- [18] De Bruyne, K. 2006. The location of economic activity: First versus second nature core-periphery theories. *Tijdschr. voor Econ. en Manag.*, 11, pp. 75-104.
- [19] Weber, A. 1909. *Ueber den Standort der Industrien*. Tübingen: J. C. B. Mohr (Paul Siebeck).
- [20] Moses, L.N. 1958. Location and the theory of production. *Q. J. Econ.*, 72(2), pp. 259-272.
- [21] Hotelling, H. 1929. Stability in competition. *Econ. J.*, 39(153), pp. 41-57.
- [22] Palander, T. 1935. *Beiträge zur Standortstheorie*. Uppsala: Almqvist & Wiksells Boktryckeri.
- [23] Losch, A. 1954. *Economics of location*. Translated from the second revised edition by William H. Woglom with the assistance of Wolfgang F. Stolper. New Haven / London: Yale University Press.
- [24] Christaller, W. 1933. Die zentralen Orte in Süddeutschland: Eine ökonomisch-geographische Untersuchung über die Gesetzmässigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen. Jena: Gustav Fischer.
- [25] Gordon, I.R. & McCann, P. 2000. Industrial clusters: Complexes, agglomeration and/or social networks? *Urban Stud.*, 37(3), pp. 513-532.
- [26] Marshall, A. 1920. *Principles of economics*, 8th ed. London: Macmillan.
- [27] Storper, M. 2009. Roepke lecture in economic geography regional context and global trade. *Econ. Geogr.*, 85(1), pp. 1-21.
- [28] Dunning, J.H. 1983. Market power of the firm and international transfer of technology. *Int. J. Ind. Organ.*, 1(1), pp. 333-351.
- [29] Dunning, J.H. 1988. The eclectic paradigm of international production: A restatement and some possible extensions. *J. Int. Bus. Stud.*, 19(1), pp. 1-31.
- [30] Dunning, J.H. 1998. Location and the multinational enterprise: A neglected factor? *J. Int. Bus. Stud.*, 29(1), pp. 45-66.
- [31] Porter, M.E. 1990. The competitive advantage of nations. *Harv. Bus. Rev.*, 68(April), pp. 73-93.
- [32] Smit, A.J. 2010. The competitive advantage of nations: Is Porter's diamond framework a new theory that explains the international competitiveness of countries? *South. African Bus. Rev.*, 14(1), pp. 105-130.
- [33] McCann, P. 2008. Agglomeration economics. In C. Karlsson, ed., *Handbook of research on cluster theory*, pp. 23-38. Cheltenham, UK / Northampton, MA: Edward Elgar.
- [34] Ferdows, K. 1997. Making the most of foreign factories. *Harv. Bus. Rev.*, 75(2), pp. 73-88.
- [35] Cheng, Y., Farooq, S. & Johansen, J. 2015. International manufacturing network: Past, present, and future. *Int. J. Oper. Prod. Manag.*, 35(3), pp. 392-429.
- [36] MacCarthy, B.L. & Atthirawong, W. 2003. Factors affecting location decisions in international operations – a Delphi study. *Int. J. Oper. Prod. Manag.*, 23(7), pp. 794-818.
- [37] Pongpanich, C. 1999. Insights into product manufacturing location decisions. Thesis. University of Cambridge.
- [38] Ketokivi, M., Turkulainen, V., Seppälä, T., Rouvinen, P. & Ali-Yrkkö, J. 2017. Why locate manufacturing in a high-cost country? A case study of 35 production location decisions. *J. Oper. Manag.*, 49-51, pp. 20-30.
- [39] Gray, J.V., Esenduran, G., Rungtusanatham, M.J. & Skowronski, K. 2017. Why in the world did they reshore? Examining small to medium-sized manufacturer decisions. *J. Oper. Manag.*, 49-51, pp. 37-51.
- [40] Lundvall, B. 2007. National innovation systems – Analytical concept and development tool. *Ind. Innov.*, 14(1), pp. 95-119.
- [41] Godin, B. 2009. National innovation system: The systems approach in historical perspective. *Sci. Technol. Hum. Values*, 34(4), pp. 476-501.
- [42] Cooke, P., Gomez Uranga, M. & Etzebarria, G. 1997. Regional innovation systems: Institutional and organisational dimensions. *Res. Policy*, 26(4-5), pp. 475-491.
- [43] Breschi, S. & Malerba, F. 1997. Sectoral innovation systems: Technological regimes, Schumpeterian dynamics, and spatial boundaries. In C. Edquist, ed., *Systems of innovation: Technologies, Institutions and Organisation*. London: Pinter, pp. 130-156.
- [44] Malerba, F. 2002. Sectoral systems of innovation and production. *Res. Policy*, 31, pp. 247-264.
- [45] Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S. & Smits, R.E.H.M. 2007. Functions of innovation systems: A new approach for analysing technological change. *Technol. Forecast. Soc. Change*, 74(4), pp. 413-432.
- [46] Berges, A., Jacobsson, S., Carlsson, B., Lindmark, S. & Rickne, A. 2008. Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Res. Policy*, 37(3), pp. 407-429.
- [47] Wieczorek, A.J. & Hekkert, M.P. 2012. Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. *Sci. Public Policy*, 39(September), pp. 74-87.
- [48] Geels, F. 2004. From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Res. Policy*, 33, pp. 897-920.
- [49] Geels, F.W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., Neukirch, M. & Wassermann, S. 2016. The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990-2014). *Res. Policy*, 45(4), pp. 896-913.
- [50] Gereffi, G., Humphrey, J. & Sturgeon, T. 2005. The governance of global value chains. *Rev. Int. Polit. Econ.*, 12(1), pp. 78-104.
- [51] Henderson, J., Dicken, P., Hess, M., Coe, N. & Yeung, H.W.-C. 2002. Global production networks and the analysis of economic development. *Rev. Int. Polit. Econ.*, 9(3), pp. 436-464.

- [52] Gereffi, G. & Lee, J. 2012. Why the world suddenly cares about global supply chains. *J. Supply Chain Manag.*, 48(3), pp. 24-32.
- [53] Ravenhill, J. 2014. Global value chains and development. *Rev. Int. Polit. Econ.*, 21(1), pp. 264-274.
- [54] SCImago Lab. 2018. *SCImago journal & country rank: Journal rank*. [Online]. Available at: <https://www.scimagojr.com/journalrank.php> [Accessed: 25-Jul-2018].
- [55] González-Pereira, B., Guerrero-Bote, V.P. & Moya-Aneón, F. 2010. A new approach to the metric of journals scientific prestige: The SJR indicator. *J. Informetr.*, 4(3), pp. 379-391.
- [56] Falagas, M.E., Kouranos, V.D., Arencibia-Jorge, R. & Karageorgopoulos, D.E. 2008. Comparison of SCImago journal rank indicator with journal impact factor. *FASEB J.*, 22(8), pp. 2623-2628.
- [57] Jacsó, P. 2010. Comparison of journal impact rankings in the SCImago Journal & Country Rank and the Journal Citation Reports databases. *Online Inf. Rev.*, 34(4), pp. 642-657.
- [58] Head, K., Ries, J. & Swenson, D. 1995. Agglomeration benefits and location choice: Evidence from Japanese manufacturing investments in the United States. *J. Int. Econ.*, 38(3-4), pp. 223-247.
- [59] Krugman, P. 1991. History and industry location: The case of the manufacturing belt. *Am. Econ. Rev.*, 81(2), pp. 80-83.
- [60] Brainard, S.L. 1997. An empirical assessment of the proximity-concentration trade-off between multinational sales and trade. *Am. Econ. Rev.*, 87(4), pp. 520-544.
- [61] Bloom, N., Sadun, R. & Van Reenen, J. 2012. The organization of firms across countries. *Q.J. Econ.*, 127(4), pp. 1663-1705.
- [62] Hall, R.E. & Jones, C.I. 1999. Why do some countries produce so much more output per worker than others? *Q. J. Econ.*, 114(1), pp. 83-116.
- [63] Blonigen, B.A., Ellis, C.J. & Fausten, D. 2005. Industrial groupings and foreign direct investment. *J. Int. Econ.*, 65(1), pp. 75-91.
- [64] Cheng, L.K. & Kwan, Y.K. 2000. What are the determinants of the location of foreign direct investment? The Chinese experience. *J. Int. Econ.*, 51(2), pp. 379-400.
- [65] Coughlin, C.C., Terza, J.V. & Arromdee, V. 1991. State characteristics and the location of foreign direct investment within the United States. *Rev. Econ. Stat.*, 73(4), pp. 675-683.
- [66] Antràs, P. & Helpman, E. 2004. Global sourcing. *J. Polit. Econ.*, 112(3), pp. 552-580.
- [67] Grossman, G. & Helpman, E. 2005. Outsourcing in a global economy. *Rev. Econ. Stud.*, 72(1), pp. 135-159.
- [68] Gennaioli, N., La Porta, R., Lopez-de-Silanes, F. & Shleifer, A. 2013. Human capital and regional development. *Q. J. Econ.*, 128(1), pp. 105-164.
- [69] Bresnahan, T., Gambardella, A. & Saxenian, A. 2001. 'Old economy' inputs for 'new economy' outcomes: Cluster formation in the new Silicon Valleys. *Ind. Corp. Chang.*, 10(4), pp. 835-860.
- [70] Henry, N. & Pinch, S. 2001. Neo-Marshallian nodes, institutional thickness, and Britain's 'Motor Sport Valley': Thick or thin? *Environ. Plan. A*, 33(7), pp. 1169-1183.
- [71] Malmberg, A. & Maskell, P. 2002. The elusive concept of localization economies: Towards a knowledge-based theory of spatial clustering. *Environ. Plan. A*, 34(3), pp. 429-449.
- [72] Martin, R. & Sunley, P. 2003. Deconstructing clusters: Chaotic concept or policy panacea? *J. Econ. Geogr.*, 3(1), pp. 5-35.
- [73] Pinch, S., Henry, N., Jenkins, M. & Tallman, S. 2003. From 'industrial districts' to 'knowledge clusters': A model of knowledge dissemination and competitive advantage in industrial agglomerations. *J. Econ. Geogr.*, 3(4), pp. 373-388.
- [74] Sturgeon, T.J. 2003. What really goes on in Silicon Valley? Spatial clustering and dispersal in modular production networks. *J. Econ. Geogr.*, 3(2), pp. 199-225.
- [75] Suire, R. & Vicente, J. 2009. Why do some places succeed when others decline? A social interaction model of cluster viability. *J. Econ. Geogr.*, 9(3), pp. 381-404.
- [76] Wei, Y.D., Li, W. & Wang, C. 2007. Restructuring industrial districts, scaling up regional development: A study of the Wenzhou model, China. *Econ. Geogr.*, 83(4), pp. 421-444.
- [77] Torre, A. & Rallet, A. 2005. Proximity and localization. *Reg. Stud.*, 39(1), pp. 47-59.
- [78] Maskell, P. & Malmberg, A. 1999. The competitiveness of firms and regions. *Eur. Urban Reg. Stud.*, 6(1), pp. 9-25.
- [79] Mariotti, S., Piscitello, L. & Elia, S. 2010. Spatial agglomeration of multinational enterprises: The role of information externalities and knowledge spillovers. *J. Econ. Geogr.*, 10(4), pp. 519-538.
- [80] Fitjar, R.D. & Rodríguez-Pose, A. 2011. When local interaction does not suffice: Sources of firm innovation in urban Norway. *Environ. Plan. A*, 43(6), pp. 1248-1267.
- [81] Bel, G. & Fageda, X. 2008. Getting there fast: Globalization, intercontinental flights and location of headquarters. *J. Econ. Geogr.*, 8(4), pp. 471-495.
- [82] Stam, E. 2007. Why butterflies don't leave: Locational behavior of entrepreneurial firms. *Econ. Geogr.*, 83(1), pp. 27-50.
- [83] Mair, A., Florida, R. & Kenney, M. 1988. The new geography of automobile production: Japanese transplants in North America. *Econ. Geogr.*, 64(4), pp. 352-373.
- [84] Venables, A.J. 2005. Spatial disparities in developing countries: Cities, regions, and international trade. *J. Econ. Geogr.*, 5(1), pp. 3-21.
- [85] Robert-Nicoud, F. 2005. The structure of simple 'new economic geography' models (or, On identical twins). *J. Econ. Geogr.*, 5(2), pp. 201-234.
- [86] Barkema, H.G., Bell, J.H.J. & Pennings, J.M. 1996. Foreign entry, cultural barriers, and learning. *Strateg. Manag. J.*, 17(2), pp. 151-166.
- [87] Song, J. 2002. Firm capabilities and technology ladders: Sequential foreign direct investments of Japanese electronics firms in East Asia. *Strateg. Manag. J.*, 23(3), pp. 191-210.

- [88] Belderbos, R., Olffen, W.V. & Zou, J. 2011. Generic and specific social learning mechanisms in foreign entry location choice. *Strateg. Manag. J.*, 32(12), pp. 1309-1330.
- [89] Belderbos R. & Sleuwaegen, L. 2005. Competitive drivers and international plant configuration strategies: A product-level test. *Strateg. Manag. J.*, 26(6), pp. 577-593.
- [90] Cantwell, J. & Mudambi, R. 2005. MNE competence-creating subsidiary mandates. *Strateg. Manag. J.*, 26(12), pp. 1109-1128.
- [91] Feinberg, S.E. & Gupta, A.K. 2004. Knowledge spillovers and the assignment of R&D responsibilities to foreign subsidiaries. *Strateg. Manag. J.*, 25(8-9), pp. 823-845.
- [92] Hennart, J.-F. & Park, Y.-R. 1994. Location, governance, and strategic determinants of Japanese manufacturing investment in the United States. *Strateg. Manag. J.*, 15(6), pp. 419-436.
- [93] Madhok, A. 1997. Cost, value and foreign market entry mode: The transaction and the firm. *Strateg. Manag. J.*, 18(1), pp. 39-61.
- [94] Medcof, J.W. 2001. Resource-based strategy and managerial power in networks of internationally dispersed technology units. *Strateg. Manag. J.*, 22(11), pp. 999-1012.
- [95] Rugman, A.M. & Verbeke, A. 2001. Subsidiary-specific advantages in multinational enterprises. *Strateg. Manag. J.*, 22(3), pp. 237-250.
- [96] Bell, G.G. 2005. Clusters, networks, and firm innovativeness. *Strateg. Manag. J.*, 26(3), pp. 287-295.
- [97] McEvily, B. & Zaheer, A. 1999. Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strateg. Manag. J.*, 20(12), pp. 1133-1156.
- [98] Canina, L., Enz, C.A. & Harrison, J.S. 2005. Agglomeration effects and strategic orientations: Evidence from the U.S. lodging industry. *Acad. Manag. J.*, 48(4), pp. 565-581.
- [99] Decarolis, D.M. & Deeds, D.L. 1999. The impact of stocks and flows of organizational knowledge on firm performance: An empirical investigation of the biotechnology industry. *Strateg. Manag. J.*, 20(10), pp. 953-968.
- [100] Haug, P. 1985. A multiple-period, mixed-integer-programming model for multinational facility location. *J. Manage.*, 11(3), pp. 83-96.
- [101] Mueller, V., Rosenbusch, N. & Bausch, A. 2013. Success patterns of exploratory and exploitative innovation: A meta-analysis of the influence of institutional factors. *J. Manage.*, 39(6), pp. 1606-1636.
- [102] Bogataj, D. & Bogataj, M. 2007. Measuring the supply chain risk and vulnerability in frequency space. *Int. J. Prod. Econ.*, 108(1-2), pp. 291-301.
- [103] Christopher, M. & Towill, D.R. 2000. Supply chain migration from lean and functional to agile and customised. *Supply Chain Manag.*, 5(4), pp. 206-213.
- [104] Gray, J.V., Roth, A.V. & Leiblein, M.J. 2011. Quality risk in offshore manufacturing: Evidence from the pharmaceutical industry. *J. Oper. Manag.*, 29(7-8), pp. 737-752.
- [105] Karpak, B. & Topcu, I. 2010. Small medium manufacturing enterprises in Turkey: An analytic network process framework for prioritizing factors affecting success. *Int. J. Prod. Econ.*, 125(1), pp. 60-70.
- [106] Baron, O., Milner, J. & Naseraldin, H. 2011. Facility location: A robust optimization approach. *Prod. Oper. Manag.*, 20(5), pp. 772-785.
- [107] Bhatnagar, R. & Sohal, A.S.A. 2005. Supply chain competitiveness: measuring the impact of location factors, uncertainty and manufacturing practices. *Technovation*, 25(5), pp. 443-456.
- [108] Ellram, L.M., Tate, W.L. & Petersen, K.J. 2013. Offshoring and reshoring: An update on the manufacturing location decision. *J. Supply Chain Manag.*, 49(2), pp. 14-22.
- [109] Vila, D., Martel, A. & Beauregard, R. 2006. Designing logistics networks in divergent process industries: A methodology and its application to the lumber industry. *Int. J. Prod. Econ.*, 102(2), pp. 358-378.
- [110] Badri, M.A. 1999. Combining the analytic hierarchy process and goal programming for global facility location-allocation problem. *Int. J. Prod. Econ.*, 62(3), pp. 237-248.
- [111] Gebennini, E., Gamberini, R. & Manzini, R. 2009. An integrated production-distribution model for the dynamic location and allocation problem with safety stock optimization. *Int. J. Prod. Econ.*, 122(1), pp. 286-304.
- [112] Thanh, P.N., Bostel, N. & Péton, O. 2008. A dynamic model for facility location in the design of complex supply chains. *Int. J. Prod. Econ.*, 113(2), pp. 678-693.
- [113] Christensen, J.F. 1995. Asset profiles for technological innovation. *Res. Policy*, 24(5), pp. 727-745.
- [114] Gerybadze, A. & Reger, G. 1999. Globalization of R&D: Recent changes in the management of innovation in transnational corporations. *Res. Policy*, 28(2-3), pp. 251-274.
- [115] Von Zedtwitz, M. & Gassmann, O. 2002. Market versus technology drive in R&D internationalization: Four different patterns of managing research and development. *Res. Policy*, 31(4), pp. 569-588.
- [116] Håkanson, L. & Nobel, R. 1993. Foreign research and development in Swedish multinationals. *Res. Policy*, 22(5-6), pp. 373-396.
- [117] Kenney, M. & Florida, R. 1994. The organization and geography of Japanese R&D: Results from a survey of Japanese electronics and biotechnology firms. *Res. Policy*, 23(3), pp. 305-322.
- [118] Kessler, E.H. & Chakrabarti, A.K. 1999. Speeding up the pace of new product development. *J. Prod. Innov. Manag.*, 16(3), pp. 231-247.
- [119] Love, J.H. & Roper, S. 2001. Location and network effects on innovation success: Evidence for UK, German and Irish manufacturing plants. *Res. Policy*, 30(4), pp. 643-661.
- [120] Meyer-Krahmer, F. & Reger, G. 1999. New perspectives on the innovation strategies of multinational enterprises: Lessons for technology policy in Europe. *Res. Policy*, 28(7), pp. 751-776.
- [121] Miller, R. 1994. Global R & D networks and large-scale innovations: The case of the automobile industry. *Res. Policy*, 23(1), pp. 27-46.
- [122] Patel, P. & Vega, M. 1999. Patterns of internationalisation of corporate technology: Location vs home country advantages. *Res. Policy*, 28(2-3), pp. 145-155.

- [123] Petruzzelli, A.M. 2011. The impact of technological relatedness, prior ties, and geographical distance on university-industry collaborations: A joint-patent analysis. *Technovation*, 31(7), pp. 309-319.
- [124] Colombo, M.G. & Delmastro, M. 2002. How effective are technology incubators? Evidence from Italy. *Res. Policy*, 31(7), pp. 1103-1122.
- [125] Löfsten, H. & Lindelöf, P. 2002. Science parks and the growth of new technology-based firms – Academic-industry links, innovation and markets. *Res. Policy*, 31(6), pp. 859-876.
- [126] Löfsten, H. & Lindelöf, P. 2003. Determinants for an entrepreneurial milieu: Science parks and business policy in growing firms. *Technovation*, 23(1), pp. 51-64.
- [127] Cantwell, J. & Vertova, G. 2004. Historical evolution of technological diversification. *Res. Policy*, 33(3), pp. 511-529.
- [128] Guellec, D. & Van Pottelsberghe de la Potterie, B. 2001. The internationalisation of technology analysed with patent data. *Res. Policy*, 30(8), pp. 1253-1266.
- [129] Howells, J. 1990. The location and organisation of research and development: New horizons. *Res. Policy*, 19(2), pp. 133-146.
- [130] Audretsch, D.B., Lehmann, E.E. & Warning, S. 2005. University spillovers and new firm location. *Res. Policy*, 34(7), pp. 1113-1122.
- [131] Audretsch, D.B. & Lehmann, E.E. 2005. Does the knowledge spillover theory of entrepreneurship hold for regions? *Res. Policy*, 34(8), pp. 1191-1202.
- [132] Baptista, R. & Swann, P. 1998. Do firms in clusters innovate more? *Res. Policy*, 27(5), pp. 525-540.
- [133] Delgado, M., Porter, M.E. & Stern, S. 2014. Clusters, convergence, and economic performance. *Res. Policy*, 43(10), pp. 1785-1799.
- [134] Gittelman, M. 2006. National institutions, public-private knowledge flows, and innovation performance: A comparative study of the biotechnology industry in the US and France. *Res. Policy*, 35(7), pp. 1052-1068.
- [135] Iammarino, S. & McCann, P. 2006. The structure and evolution of industrial clusters: Transactions, technology and knowledge spillovers. *Res. Policy*, 35(7), pp. 1018-1036.
- [136] Silvestre, B.d.S. & Dalcol, P.R.T. 2009. Geographical proximity and innovation: Evidences from the Campos Basin oil & gas industrial agglomeration – Brazil. *Technovation*, 29, pp. 546-561.
- [137] Stuart, T. & Sorenson, O. 2003. The geography of opportunity: Spatial heterogeneity in founding rates and the performance of biotechnology firms. *Res. Policy*, 32(2 SPEC.), pp. 229-253.
- [138] Tappeiner, G., Hauser, C. & Walde, J. 2008. Regional knowledge spillovers: Fact or artifact? *Res. Policy*, 37(5), pp. 861-874.
- [139] Amiti, M. & Smarzynska Javorcik, B. 2008. Trade costs and location of foreign firms in China. *J. Dev. Econ.*, 85(1-2), pp. 129-149.
- [140] Dean, J.M., Lovely, M.E. & Wang, H. 2009. Are foreign investors attracted to weak environmental regulations? Evaluating the evidence from China. *J. Dev. Econ.*, 90(1), pp. 1-13.
- [141] Gastanaga, V.M., Nugent, J.B. & Pashamova, B. 1998. Host country reforms and FDI inflows: how much difference do they make? *World Dev.*, 26(7), pp. 1299-1314.
- [142] Wang, J. 2013. The economic impact of special economic zones: Evidence from Chinese municipalities. *J. Dev. Econ.*, 101(1), pp. 133-147.
- [143] Kumar, N. 1996. Intellectual property protection, market orientation and location of overseas R&D activities by multinational enterprises. *World Dev.*, 24(4), pp. 673-688.
- [144] Démurger, S. 2001. Infrastructure development and economic growth: An explanation for regional disparities in China? *J. Comp. Econ.*, 29(1), pp. 95-117.
- [145] Frigant, V. & Lung, Y. 2002. Geographical proximity and supplying relationships in modular production. *Int. J. Urban Reg. Res.*, 26(4), pp. 742-755.
- [146] Larsson, A. 2002. The development and regional significance of the automotive industry: Supplier parks in western Europe. *Int. J. Urban Reg. Res.*, 26(4), pp. 767-784.
- [147] Fujita, M. & Thisse, J.-F. 1986. Spatial competition with a land market: Hotelling and Von Thunen unified. *Rev. Econ. Stud.*, 53(5), pp. 819-841.
- [148] Evans, C.L. & Harrigan, J. 2005. Distance, time, and specialization: Lean retailing in general equilibrium. *Am. Econ. Rev.*, 95(1), pp. 292-313.
- [149] Jabareen, Y. 2009. Building a conceptual framework: Philosophy, definition, and procedure. *Int. J. Qual. Methods*, 8(4), pp. 49-62.

APPENDIX A: DETAILED REVIEW RESULTS

This appendix provides additional information that is relevant to the results section of the paper. In particular, Table A.1 links the location-related factors described in Section 4.5 to the articles in which these factors were identified. Table A.2 links the moderating factors described in Section 4.5 to the articles in which they were identified, and provides a short illustrative impact. Finally, Table A.3 links the dynamic considerations identified in Section 4.6 to the articles in which they were identified.

Table A.1: Location-related factors linked to references

<i>Location-related factors</i>	<i>Reference</i>
Upstream (input) linkages	[7], [15]
Availability and cost of intermediate inputs	[67]
Proximity to suppliers	[10], [72], [81], [83], [107], [110]
Availability of knowledgeable suppliers	[108]
Cost of supplier management	[10]
Quality of inputs	[10]
Labour costs	[30], [64]-[66], [87], [89], [92], [100]
Human capital available	[4], [62], [68]
Availability of the necessary skills	[30], [69], [72], [81], [87]-[90], [92], [95], [98]-[101], [107], [108], [139]
Cost of utilities	[10], [110]
Specialised support services	[107], [109]
Natural advantage	[7], [68]
Cost of capital	[6], [10], [30], [99], [100], [105]
Physical capital	[62]
Cost of land	[110]
Infrastructure availability, quality, and reliability	[30], [64], [65], [71], [81], [88], [90], [99], [107], [108]
Transport costs	[6], [30], [92], [100], [107], [109]-[112]
Taxes	[4], [10], [65], [81], [100], [108]-[110], [140]
Exchange rates	[4], [6], [10], [87], [89], [100], [107]-[109]
Investment incentives	[30], [100], [104], [107], [108], [141]
Promotional activity	[65]
Training grants	[30], [100]
Environmental regulation	[142]
Special economic zones	[64], [140]
Trade protection	[4], [6], [10], [30], [60], [89], [92], [100], [104], [108], [109], [140]
Knowledge capacity and foundational technology	[130], [131], [137]
Venture capital	[137]

Table A.2: Moderating factors linked to references, and illustrative impact

	<i>Moderating factor</i>	<i>Illustrative impact</i>	<i>Reference</i>
Industry/product-related	Complexity of production processes.	More complex industry: skills availability and experience will matter more.	[104]
	Dynamism of the product market environment.	More dynamic product market: availability of knowledgeable supporting firms may become more important.	[93]
	How easy the type of knowledge employed is spilled over.	Type of knowledge required in industry not easily spilled over beyond clusters: location of competitors and supporting industries becomes more important.	[73]
	Maturity of products.	Mature products with established technologies: manufacturing costs become more important; science base becomes less important.	[86], [89], [93]
	Economies of scale.	Higher internal returns to scale: Cost factors play a bigger role as production takes place in fewer places and differences are magnified.	[14], [27], [92]
	Testability of the product.	Output less testable: confidence in quality management of process (and hence antecedents of such confidence) becomes more important.	[104]
Firm-related	Existing global footprint.	Existing global footprint: considering existing sites reduces impact of other location determinants.	[10]
	Experience in different regions.	Experience in region improves effective location determinants for firm in region owing to experience/learning curve effects.	[87], [92]
	Interdependence between different functions in firm.	Higher interdependence: other firm locations become more important, reducing the importance of other location determinants relevant to specific activity.	[114], [116], [117], [120], [121], [129]
	Life cycle stage of the company.	Emerging firms may have different priorities/requirements than established firms (e.g., venture capital).	[27], [69].
	Size of the firm.	Smaller firms have less leverage over suppliers; thus supplier location becomes more important.	[2], [30], [80], [93]
	Technology intensiveness.	More technology-intensive: skills availability will matter more.	[2], [89], [92]

Table A.3: Dynamic considerations linked to references

	<i>Dynamic considerations</i>	<i>Reference</i>
General economics	Snowball effect because of interaction demand and supply	[14]
	Snowball effect because of input-output linkages	[15]
	Empirical observation of co-location benefits or spillover effects/externalities	[7]
	Snowball effect because of human capital externalities	[68]
	Path dependence and 'historical accidents' in the agglomeration of economic activities	[7], [58], [59], [65]
Economic geography	NEG models in general economics provide little insight into interaction between different types of agglomeration economies	[27], [84], [85]
	Identify three types of agglomeration models to explain industrial clusters	[25]
	Social structure and institutions	[25], [78]
	Opportunity cost of skilled labour, education, and international cooperation	[69]
	Cultural norms	[80]
	Resources at the disposal of actors that impact their access to information and knowledge, as well as intellectual property protection	[27], [78]
	Benefits accumulating from spillovers from competing firms	[79]
	Rivalry in the factor and final market	[69], [72], [83]
General management	Path dependence	[30], [88]
	Localised knowledge spillovers	[2], [30], [89], [91], [99]
	Shared infrastructure	[2]
	Hysteresis and contingencies that affect the impact of local experience effects	[87]
	Differentiation spillovers for service firms	[98]
	Technological progress, training costs, uncertainty modelled through a discount rate and risk expectations related to regulation	[100]
	Learning curve effects	[86]
	Bandwagon effect	[30], [88], [89]
	Behaviours dependent on the behaviour of competitors	[92], [98]
	Development of capabilities of firms over time	[30], [87], [90], [93], [95], [97], [99]
	Evolution of subsidiary specific roles and capabilities over time	[90], [94], [95]
	Exchange rate uncertainty	[89]
	Reduction of uncertainty through locational experience	[86], [89], [92]
	Risk expectations related to regulation	[30]
	Financial risks	[102], [107]
Operations and production management	Chaos risk	[102]
	Regulation risk	[104], [107], [108]
	Political risk	[10], [107], [108]
	Input supply risk	[102]
	Demand risk	[106], [107]
	Intellectual property risk	[108]
	Process quality risk	[102], [104]
	Reputational damage risk	[104]
	Expectations	[108], [110]
	Locational differences over time	[6], [108], [110]
	Supply-demand interaction may impact the magnitude of holding costs, obsolescence, and stock-outs	[6], [102], [103], [107], [109], [111], [112]
	Particular locational factors may have larger effects on locational advantages and firm performance than expected	[105]
	Customer satisfaction and value	[103], [108]
	Profit maximisation over a short planning horizon	[6], [106]
	Lead time performance	[10], [103], [104], [107], [108], [111]
	Responsiveness to customer demand	[107], [111]
	Quality performance	[10], [103]-[105], [107]
	Customer service level	[103], [107], [111]
	Time to market	[107]
	Flexibility	[10], [107]
	Environmental performance	[108], [110]
	Impact on eco-system vitality and environmental health	[10]
	Social performance	[108], [110]
	Impact on equity, safety, cohesion, civil liberties, and human rights	[10]
Innovation studies	Impact of industry agglomeration on the innovative performance of firms	[132], [133]
	Knowledge spillovers through social and human capital	[138]
	Knowledge spillovers through investment in research and development for innovation	[119], [138]
	Human capital production by universities	[130], [131], [137]
	Institutional dynamics that support commercialisation of research in a country	[134]
Development studies	Expectation about corruption	[139], [141]
	Bureaucratic delay	[141]
	Nationalisation risk	[140], [141]

APPENDIX B: FRAMEWORK DETAIL

This appendix provides additional information that is relevant to the conceptual framework presented in Section 5. In particular, Table B.1 reflects the market-related considerations that are relevant to the three types of activities. Table B.2 considers the performance dimensions related to these activities. Figure B.1 addresses the location determinants that are relevant to the market-related considerations. Figures B.2 to B.4 address the location determinants that are relevant to manufacturing-, research-, and development-related performance respectively. Figures B.5 and B.6 address the dynamic factors related to the market and the location respectively.

Table B.1: Market-related considerations linked to type of activity

<i>Subject of analysis</i>	<i>Market-related considerations</i>
Manufacturing	<ul style="list-style-type: none"> • Market size competitively accessible from location (considering different markets segments) • Market congruence with current markets
Research	<ul style="list-style-type: none"> • Sophistication of customers in region • Representativeness of local customer requirements of company's market
Development	<ul style="list-style-type: none"> • Size of market with similar tastes to local market

Table B.2: Performance dimensions linked to type of activity

<i>Subject of analysis</i>	<i>Performance dimensions</i>
Manufacturing	<ul style="list-style-type: none"> • Cost • Lead-time • Flexibility • Reliability • Responsiveness • Quality • Sustainability (environmental and social impact)
Research	<ul style="list-style-type: none"> • Responsiveness to leading customer • Ability to improve the state of the art • Protection of IP
Development	<ul style="list-style-type: none"> • Responsiveness to local tastes • Protection of IP

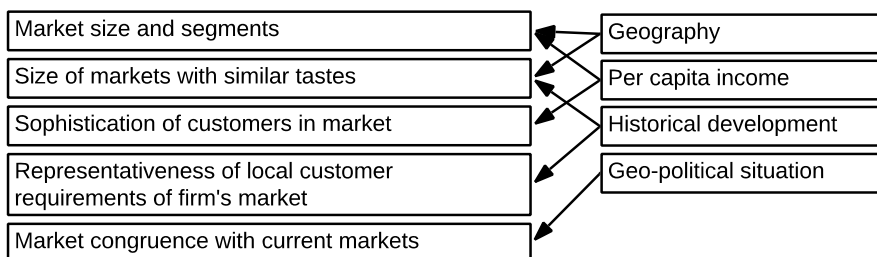


Figure B.1: Key location determinants that influence market-related considerations

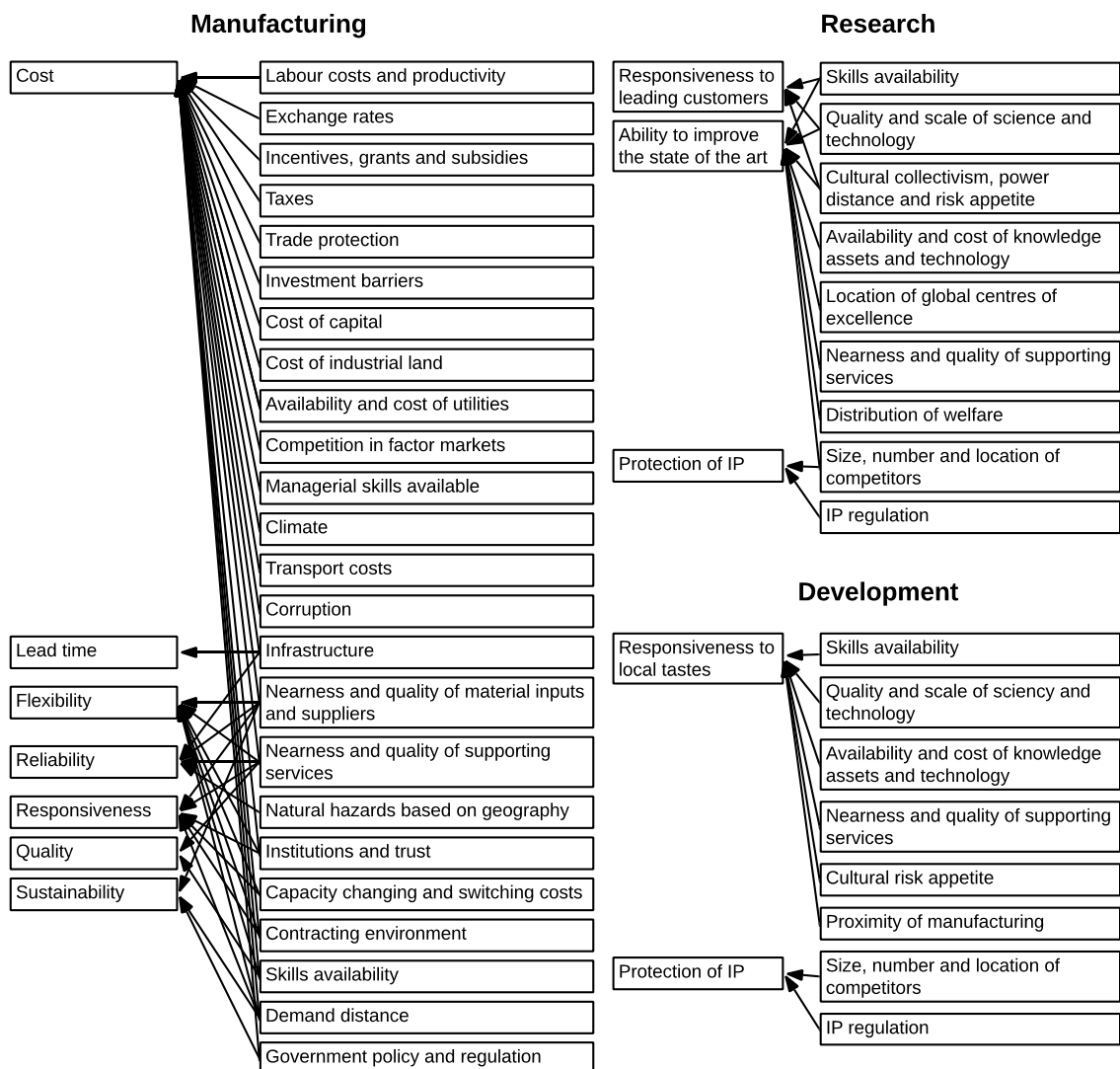


Figure B.2: Key location determinants that influence activity-related performance

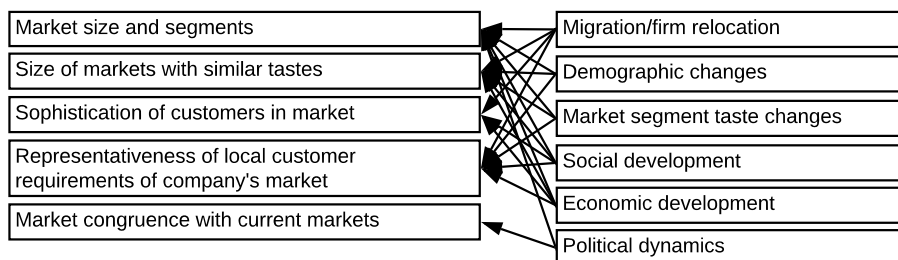


Figure B.3: Market-related dynamics

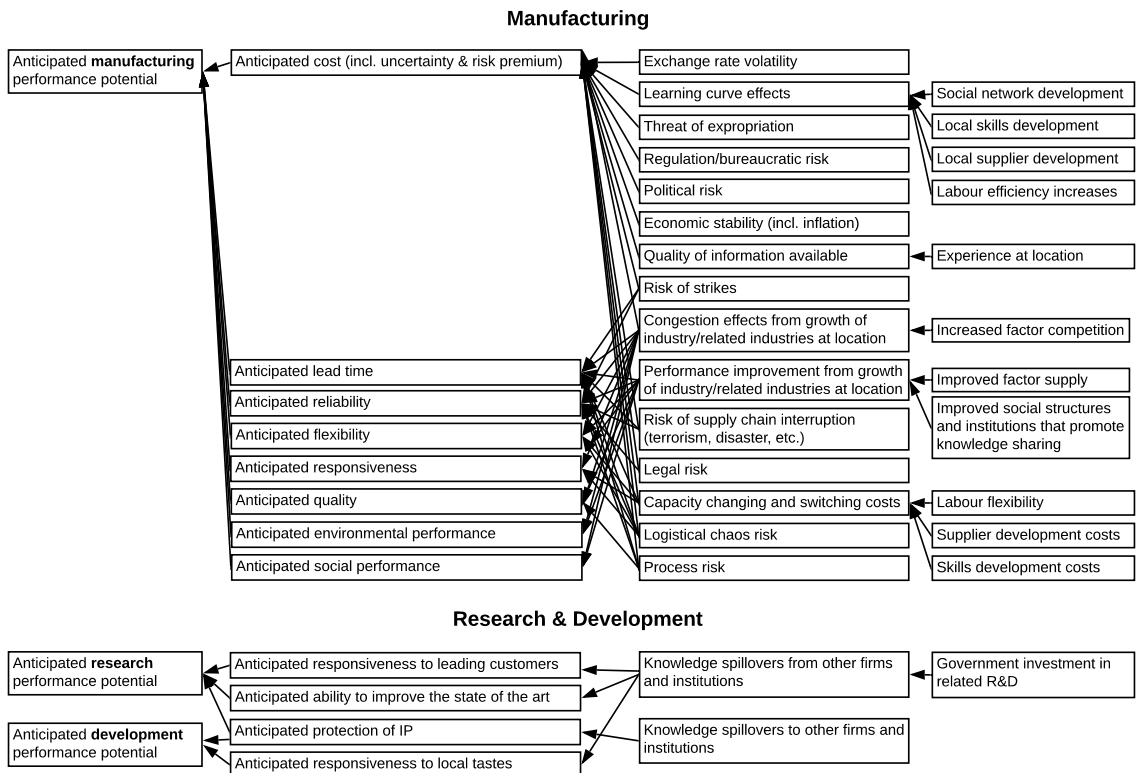


Figure B.4: Location-related dynamics

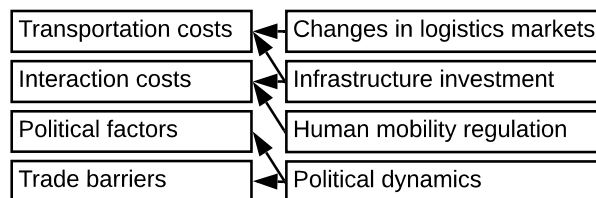


Figure B.5: Interaction moderator dynamics.